

We Claim:

Claim 1. An optical via comprising:

- 5 (a) a first waveguide in a first planar layer, said first waveguide having a first refractive index value and an input end, and supporting an optical mode with a first effective index value,
- (b) a second waveguide in a second planar layer, said second waveguide having a second refractive index value and an output end, and supporting a second optical mode with a second effective index value,
- 10 (c) said first mode of first waveguide and said second mode of second waveguide evanescently interacting over an interaction length, and
- (d) means for adjusting the magnitude of said mode-to-mode evanescent interaction, adjusting the detuning between said effective indexes of said first and second modes, and adjusting said interaction length, in such a way as to effect broadband and
- 15 substantially complete optical power transfer from said input of first waveguide to said output of second waveguide.

Claim 2. The optical via of claim 1 wherein said first refractive index value and said second refractive index value are substantially the same.

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Claim 3. The optical via of claim 1 wherein said means of adjusting the magnitude of waveguide-to-waveguide interaction comprises adjusting the physical separation between said first waveguide and said second waveguide.

25 Claim 4. The optical via of claim 1 wherein said means of adjusting the detuning between effective indexes of first and second modes comprises means for changing the waveguide width of said first waveguide or said second waveguide or both waveguides along said interaction length.

Claim 5. The optical via of claim 4 wherein said means of changing the width of said first waveguide or said second waveguide consists of tapering the waveguide dimension linearly from input end to output end over said interaction length.

5 Claim 6. The optical via of claim 1 wherein said first and second waveguides are planar waveguides fabricated from one or more of doped silica, germanium doped silica, Silicon, Silicon Nitride, Silicon Oxynitride, Silicon Oxycarbide, Indium Gallium Arsenide Phosphide, polymers, Lithium Niobate, or Tantalum Oxide.

10 Claim 7. A means for optically connecting two waveguides on two different planar layers by an optical via comprising

- (a) providing a first waveguide in a first planar layer, said first waveguide having a first refractive index value and an input end, and supporting an optical mode with a first effective index value,
- 15 (b) providing a second waveguide in a second planar layer, said second waveguide having a second refractive index value and an output end, and supporting a second optical mode with a second effective index value,
- (c) providing a region where said mode of the first waveguide on the first layer evanescently interacts with said mode of the second waveguide on the second layer over an interaction length, and
- 20 (d) means for adjusting the magnitude of said mode-to-mode evanescent interaction, adjusting the detuning between said effective indexes of said first and second modes, and adjusting said interaction length, in such a way as to effect broadband and substantially complete optical power transfer from said input of first
- 25 waveguide to said output of second waveguide.

Claim 8. The optical via of claim 1 wherein said first refractive index value and said second refractive index value are substantially the same.

Claim 9. The optical via of claim 7 wherein said means of adjusting the magnitude of waveguide-to-waveguide interaction comprises adjusting the physical separation between said first waveguide and said second waveguide.

5    Claim 10. The optical via of claim 7 wherein said means of adjusting the detuning between effective indexes of first and second modes comprises means for changing the waveguide width of said first waveguide or said second waveguide or both waveguides along said interaction length.

10    Claim 11. The optical via of claim 10 wherein said means of changing the width of said first waveguide or said second waveguide consists of tapering the waveguide dimension linearly from input end to output end over said interaction length.

15    Claim 12. The optical via of claim 8 wherein said first and second waveguides are planar waveguides fabricated from one or more of doped silica, germanium doped silica, Silicon, Silicon Nitride, Silicon Oxynitride, Silicon Oxycarbide, Indium Gallium Arsenide Phosphide, polymers, Lithium Niobate, or Tantalum Oxide.